

MAP MF-1382-M

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

**MAPS SHOWING DISTRIBUTION OF ANOMALIES BASED ON THE
USE OF SCORESUM PLOTS FOR SELECTED GROUPINGS OF
ELEMENTS IN SAMPLES OF NONMAGNETIC HEAVY-MINERAL
CONCENTRATE, WALKER LAKE 1° X 2° QUADRANGLE,
CALIFORNIA AND NEVADA**

By M.A. Chaffee

CHAFFEE—ANOMALIES BASED ON SCORESUM PLOTS, HEAVY-MINERAL CONCENTRATE,
WALKER LAKE 1° X 2° QUAD, CA-NV 1:250,000 MAP MF-1382-M

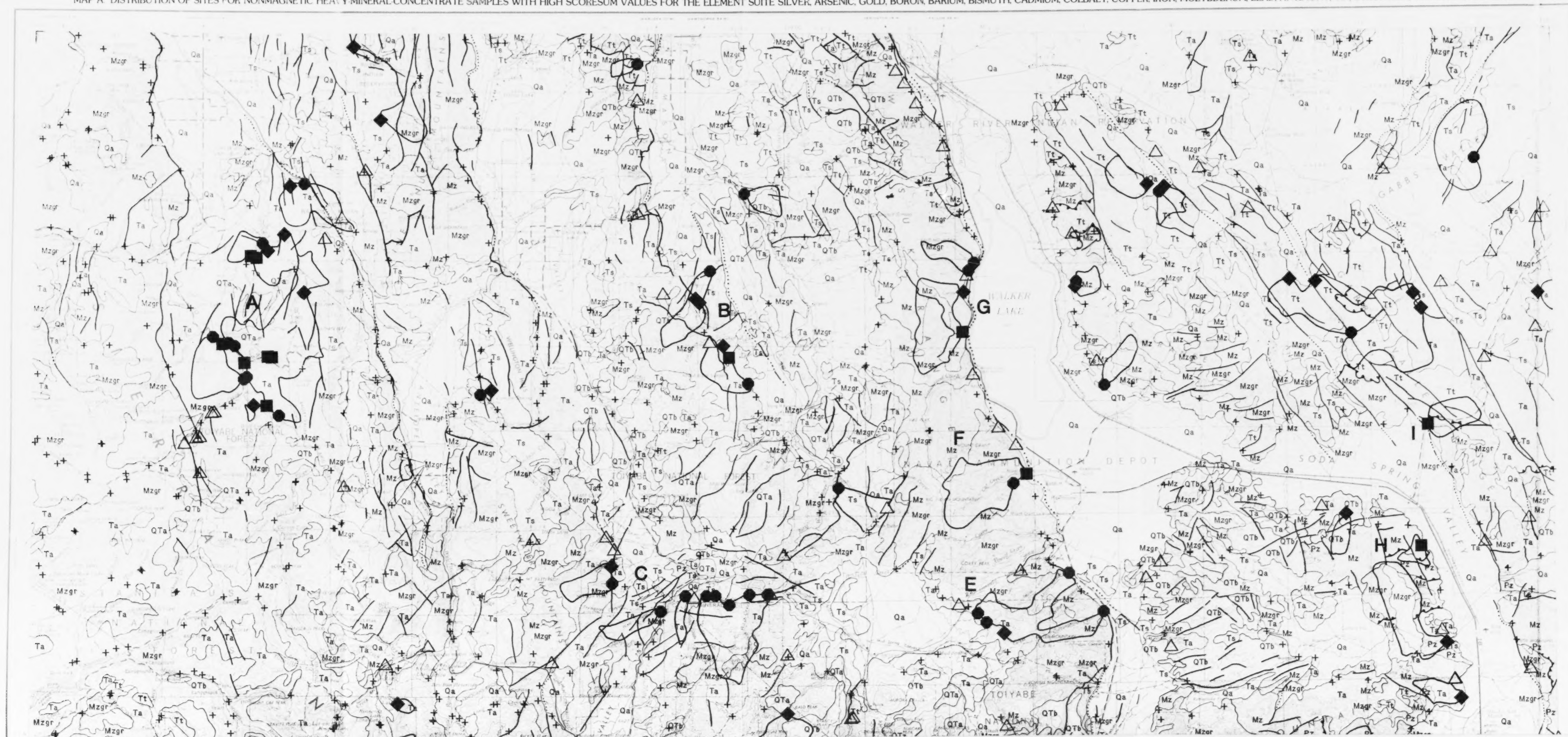
MISCELLANEOUS FIELD STUDIES MAP
Published by the U.S. Geological Survey, 1988

NEW YORK
JUN 6 1989
STATE LIBRARY



MAP A. DISTRIBUTION OF SITES FOR NONMAGNETIC HEAVY MINERAL CONCENTRATE SAMPLES WITH HIGH SCORESUM VALUES FOR THE ELEMENT SUITE SILVER, ARSENIC, GOLD, BORON, BARIUM, BISMUTH, CADMIUM, COBALT, COPPER, IRON, MOLYBDENUM, LEAD, ANTIMONY, TIN, STRONTIUM, TUNGSTEN, AND ZINC

EXPLANATION
 SAMPLE LOCALITY AND BOUNDARY OF ASSOCIATED DRAINAGE BASIN. Anomalous for two or more selected elements. Locality is at center of plotted symbol. Square symbol indicates upper 2% of the data (98th percentile). Circle symbol is next 3% of data (95th percentile). Triangle, next 5% of data (90th percentile). Plus symbol (+), remaining 88%. Darkened symbols identify the most significant sample sites.
K SIGNIFICANT ANOMALOUS AREA OR SITE—Letter is keyed to list in text



EXPLANATION
 SAMPLE LOCALITY AND BOUNDARY OF ASSOCIATED DRAINAGE BASIN. Anomalous for two or more selected elements. Locality is at center of plotted symbol. Square symbol indicates upper 2% of the data (98th percentile). Circle symbol is next 3% of data (95th percentile). Triangle, next 5% of data (90th percentile). Plus symbol (+), remaining 88%. Darkened symbols identify the most significant sample sites.
H SIGNIFICANT ANOMALOUS AREA OR SITE—Letter is keyed to list in text

Notes: The following correlation and description of the units are for the geologic base map shown in gray.

CORRELATION OF MAP UNITS	
Qa	QUATERNARY
Qt	QUATERNARY AND TERTIARY
Ta	TERTIARY
Mz	MESOZOIC
Pz	PALEOZOIC

DESCRIPTION OF MAP UNITS

Qa ALLUVIAL, LACUSTRINE, COLLUVIAL, AND GLACIAL DEPOSITS, UNCONSOLIDATED (Quaternary)—As mapped locally includes uppermost Tertiary gravel.

Qt BASAL (Quaternary and Tertiary)—Ranges in age from about 9 m.y. to less than 1 m.y.

Ta ANDESITE TO RHYOLITE (Tertiary)—Andesite flows and breccia. Minor rhyolite flows and shallow intrusive rocks. Ranges in age from about 5 m.y. to less than 1 m.y.

Ts SEDIMENTARY ROCKS (Tertiary)—Tuffaceous sandstone, siltstone, and conglomerate to gravel. Minor tuff and volcanic breccia. Ranges in age from about 12 m.y. to 2 m.y.

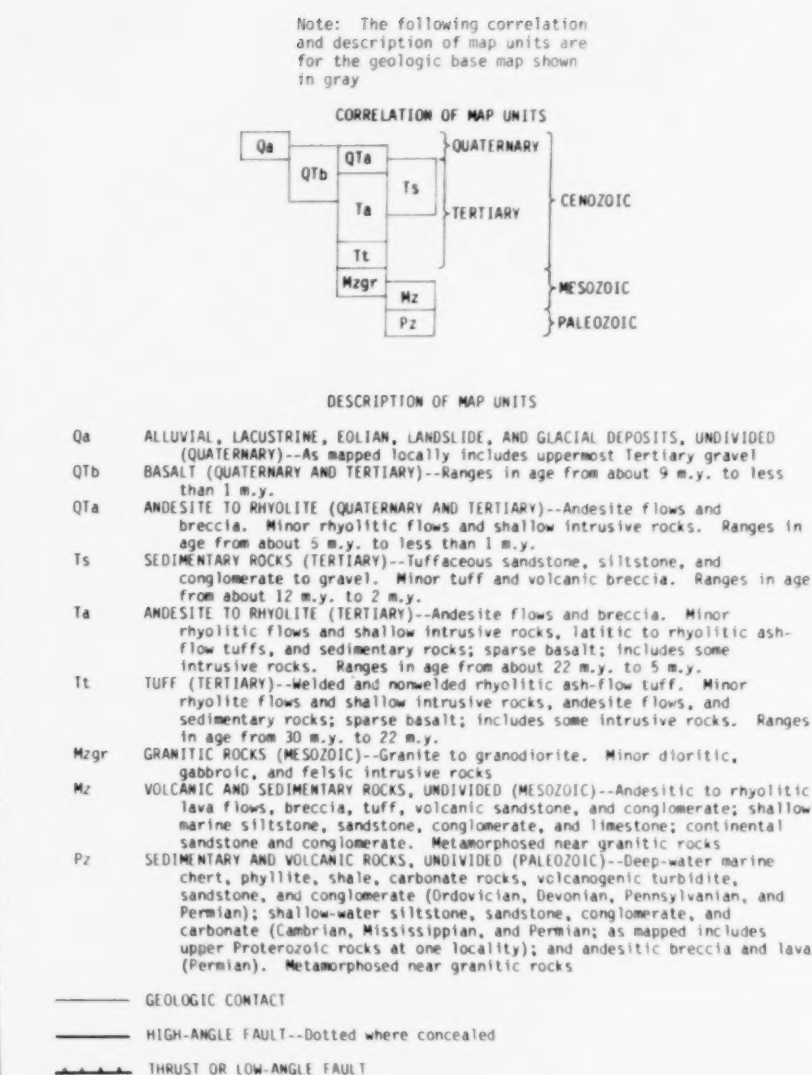
Tt TUFF (Tertiary)—Welded and nonwelded rhyolite ash-flow tuff. Minor rhyolite flows and shallow intrusive rocks. Includes some sedimentary rocks, sparse basalt. Includes some intrusive rocks. Ranges in age from 30 m.y. to 22 m.y.

Mz GRANITIC ROCKS (Mesozoic)—Granite to granodiorite. Minor dioritic, gabbroic, and felsic intrusive rocks.

Pz VOLCANIC AND SEDIMENTARY ROCKS (Paleozoic)—Andesite to rhyolite lava flows, breccia, tuff, volcanic sandstone, and conglomerate; shallow marine siltstone, sandstone, conglomerate, and limestone; continental sandstone and conglomerate. Metamorphosed near granitic rocks.

Pt SEDIMENTARY AND VOLCANIC ROCKS (Paleozoic)—Deep-water marine chert, phyllite, shale, carbonate rocks, volcanogenic turbidite, sandstone, and conglomerate (Ordovician, Devonian, Pennsylvanian, and Permian); shallow-water siltstone, sandstone, conglomerate, and carbonate (Cambrian, Mississippian, and Permian) as mapped includes upper Proterozoic rocks at one locality; and andesitic breccia and lava (Permian). Metamorphosed near granitic rocks.

— GEOLOGIC CONTACT
 --- HIGH-ANGLE FAULT—Dotted where concealed
 --- THRUST OR LOW-ANGLE FAULT



Geology simplified from Stewart and others, 1982

quadrangle. The anomaly at site (G) is probably related to scrap-metal contamination, as described previously. The anomaly at site (M) may also be related to scrap-metal contamination. The anomaly at site (N) is in the Baunside district but mined elsewhere.

One of the significant anomalies listed above are associated entirely with the Paleozoic and Mesozoic rock, especially where they are near to outcrops of the Mesozoic intrusive rocks--or with the fertile volcanic rocks. The first of these anomalies is particularly significant, as it is associated with the deposits; both environments are permissive for leakage aureoles associated with mineralized porphyry.

For all of the maps in this part of the folio there is no assurance that all the anomalies listed above are due to the same cause, or that the deposits in the categories thought to be represented by each map have in fact been identified. It is recommended that all of the maps in the entire folio be consulted as a part of any decision-making process.

REFERENCES

Chaffee, M.L., 1981, SCORMAP-A technique for displaying and evaluating multivariate geospatial information, with examples of its use in regional mineral assessment. *Geological Survey of Canada Bulletin* 136, 1-12.

Chaffee, M.L., 1985a, Use of the SCORMAP technique based on the use of *R*-mode cluster analysis for selected groups of elements in samples of mine 60-metre (0.25 mi) stream sediment or nonmetallic heavy mineral concentrate, water lake, and soil. *Geological Survey of Canada Bulletin* 138, 1-12.

Geological Survey of Canada, 1982, *Geological Survey of Canada*: U.S. scale 1:250,000.

1980a, Distributions of anomalies below the use of SCIRM plots for selected groupings of metals in the sediments of the Sacramento-San Joaquin River stream sediments, Walker lake 1 x 2 quadrangle, California and Nevada: U.S. Geological Survey Open-File Report 80-129, 60 p.

1980b, Walker Lake, Nevada, U.S. and Sulley, S.J., 1980, Preliminary data set containing geochemical analyses of samples of rock, stream sediments, and vegetation from the Walker Lake area, 1 x 2 quadrangle, California and Nevada: U.S. Geological Survey Open-File Report 80-129, 23 p.

1980c, Walker Lake, Nevada, and Sulley, S.J., 1980a, Distributions of copper, lead, zinc, cadmium, and silver in samples of mini-60 mesh (0.25 mm) stream sediments and vegetation from the Walker Lake area, 1 x 2 quadrangle, California and Nevada: U.S. Geological Miscellaneous Investigations Map no. 1-100, 10 p.

1980d, Distributions of polymorphism, lead, boron, tungsten, and gold in samples of mini-60 mesh (0.25 mm) stream sediments and vegetation from heavy-metal concentrate, Walker lake 1 x 2 quadrangle, California and Nevada: U.S. Geological Survey Open-File Report 80-130, 12 p.

1980e, Walker Lake, Nevada, Cobalt, barium, strontium, arsenic, antimony, and bismuth in samples of mini-60 mesh (0.25 mm) stream sediments and foraminifera from the Walker Lake area, 1 x 2 quadrangle, California and Nevada: U.S. Geological Survey Open-File Report 80-131, 12 p.

2° quadrangle, California and Nevada: U.S. Geological Survey Miscellaneous Publication 80-1, 1980.

1988a. Distributions of 12 selected elements in samples of water and sediment from the Colorado River, California and Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-2, scale 1:250,000.

Durbin, D. J., and C. A. J. Palmer. 1980. Sediment evaluation, water use (aquifer), California and Nevada: U.S. Department of Energy, Grand Junction Project, Report 100-100-1.

Kay, W. M., and Jones, P. L. 1980. Hydrochemical and stream sediment geochemistry, Grand Junction Project, California and Nevada: U.S. Department of Energy Report DPM-79-146-1, 51 p., 10 plates, 6 microfiches.

Grime, D. L., and Mazzanino, R. A. 1968. Direct-current arc and streaming-current methods for the determination of trace elements in the sedimentary analysis of geologic materials: U.S. Geological Survey Circular 650.

McLennan, S. M., Specimen, W. S., and Chaffee, M. S. 1981. Spectrographic and chemical analysis of water, stream-sediment, and concentrate samples from the Colorado River, California and Nevada: U.S. Geological Survey Miscellaneous Publication 81-1, 10 p.

magnetic tape from National Technical Information Service, Department of Commerce, 5205 Port Republic Road, Springfield, Virginia 22161.

Meyer, A.L., 1960, Flameless atomic-absorption determination of gold in cyanide solution. *Anal. Chem.*, 32, 77-78.

Stewart, J.H., Carlson, J.J., and Johannessen, D.F., 1969, Geologic map of the Walker Lake 1:50,000 quadrangle, California and Nevada. U.S. Geological Survey Miscellaneous Publication 1-69-1.

Wacker, L.W., Morris, R.L., and Fillo, P.A., 1970, Mineral resources of the Elbertan Basin, Elberta, Utah. U.S. Geological Survey Bulletin 1264, 10 p.

Wacker, L.W., and Morris, R.L., 1970, A preliminary geologic map of the Elberta Basin, Elberta, Utah. U.S. Geological Survey Bulletin 1264, 10 p.

Wells, J.J., 1978, Determination of silver, thiosulfate, cyanide, copper, lead, and zinc in geological samples by atomic absorption spectrophotometry using triethylmethylammonium chloride. *Analytical Chemistry*, v. 50, no. 8, 1099-1101.

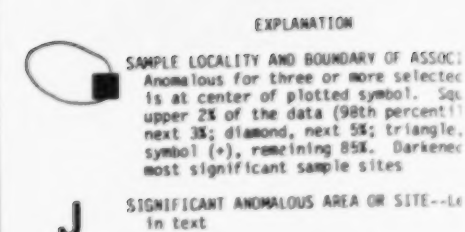
Ward, F.W., Lakin, W.W., Canney, F.C., and others, 1963, Analytical methods used in geochemical analysis of rocks and minerals. Geological Survey Bulletin 1152, 100 p.

Ward, F.W., Lakin, W.W., and others, 1964, *Geochemical Analysis*, 3rd ed., Geological Survey Bulletin 1152, 100 p.

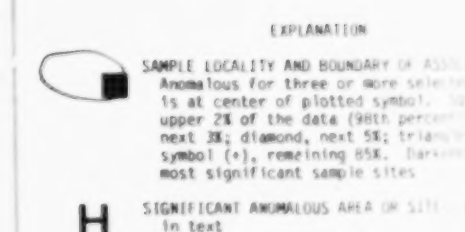
Ward, F.W., Nakagawa, H.M., Harris, I.M., and Vancsik, G.N., 1969, Atomic absorption methods of analysis useful in geochemical exploration: U.S. Geological Survey Bulletin 1289, 45 p.

Welsh, E.P., and Chao, T.T., 1975, Determination of trace amounts of antimony in geological materials by atomic absorption spectrometry: Analytical Chimica Acta, v. 76, p. 65-69.

By
M.A. Chaf
1988

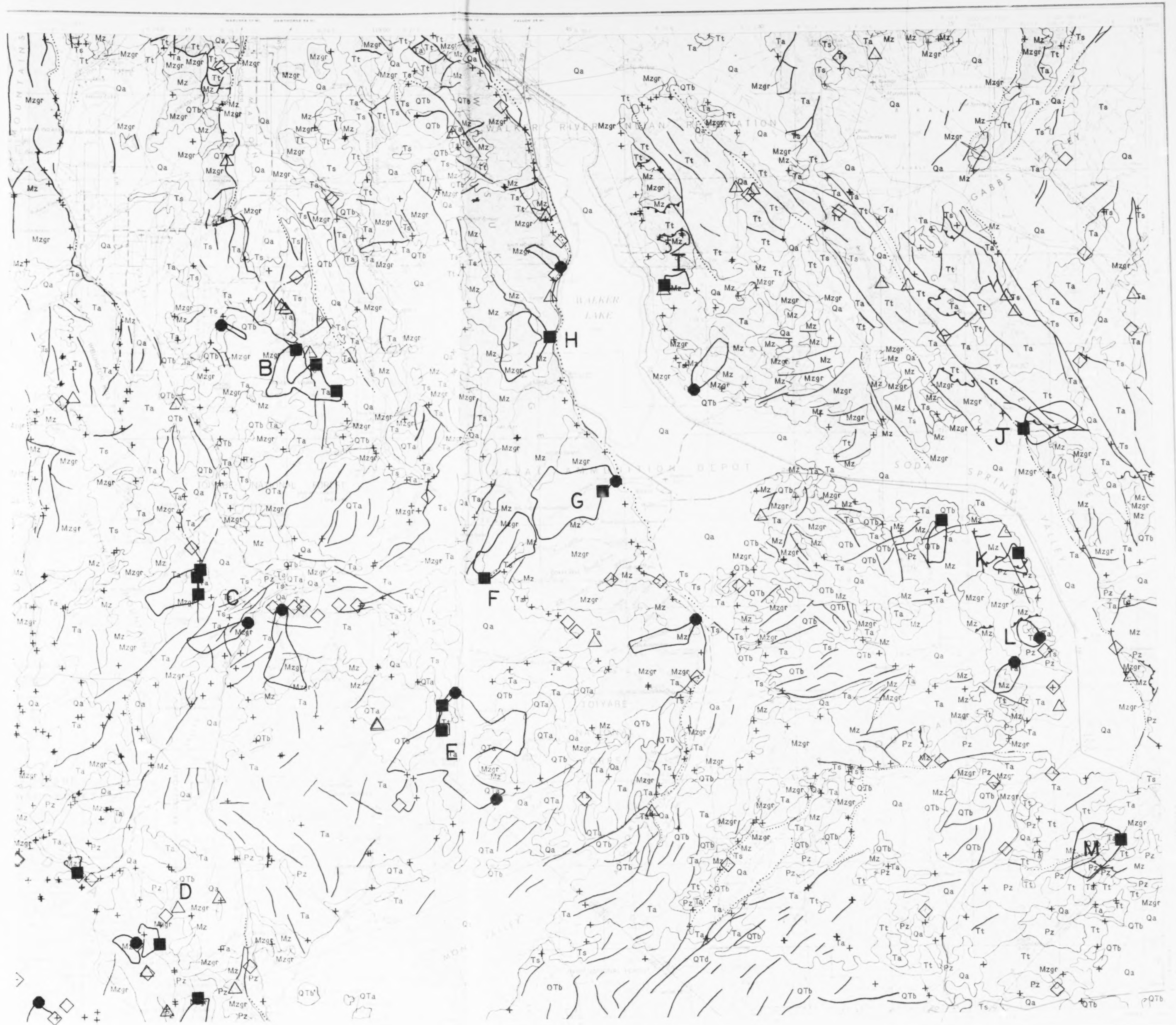


MAP C. DISTRIBUTION OF SITES FOR NONMAGNETIC HEAVY-MINERAL CONCENTRATE SAMPLES WITH HIGH SCORES/UM VALUES FOR THE ELEMENT SUITE SILVER, ARSENIC, GOLD, BARIUM, BISMUTH, COBALT, IRON, ANTIMONY, AND STRONTIUM



Qn	ALLUVIUM
Qtd	BASALTIC TUFF
Qta	ANDESITIC TUFF
Ts	SEDIMENTARY ROCKS
Ta	ANDESITIC TUFF
Tt	TUFF

best copy available

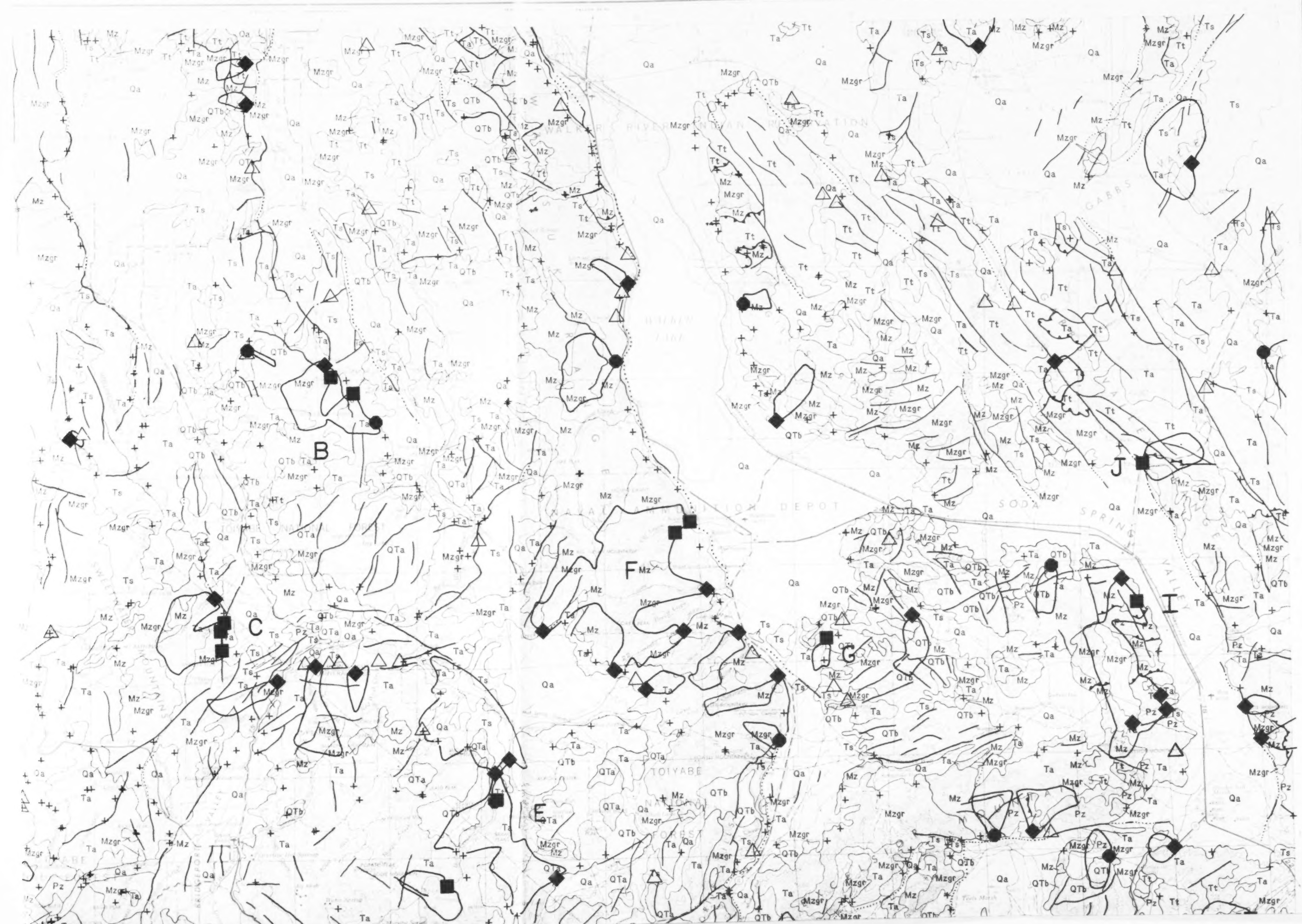


EXPLANATION

○ SAMPLE LOCALITY AND BOUNDARY OF ASSOCIATED DRAINAGE BASIN. Anomalous for three or more selected elements. Locality is at center of plotted symbol. Square symbol indicates upper 25 of the data (90th percentile). Circle symbol is next 25; diamond, next 25; triangle, next 25; and plus symbol (+), remaining 25%. Darkened symbols identify the most significant sample sites.

J SIGNIFICANT ANOMALOUS AREA OR SITE—Letter is keyed to list in text.

NONMAGNETIC HEAVY MINERAL CONCENTRATE SAMPLES WITH HIGH SCORES FOR THE ELEMENT SUITE: SILVER, ARSENIC, GOLD, BARIUM, BISMUTH, COBALT, IRON, ANTIMONY, AND STRONTIUM

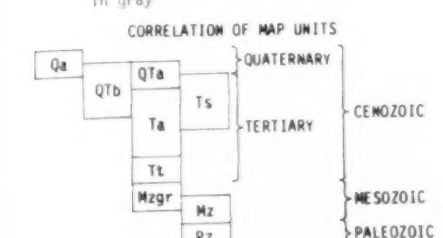


EXPLANATION

○ SAMPLE LOCALITY AND BOUNDARY OF ASSOCIATED DRAINAGE BASIN. Anomalous for three or more selected elements. Locality is at center of plotted symbol. Square symbol indicates upper 25 of the data (90th percentile). Circle symbol is next 25; diamond, next 25; triangle, next 25; and plus symbol (+), remaining 25%. Darkened symbols identify the most significant sample sites.

H SIGNIFICANT ANOMALOUS AREA OR SITE—Letter is keyed to list in text.

Note: The following correlation and description of map units are for the geologic base map shown in gray.



DESCRIPTION OF MAP UNITS

Qa ALLUVIAL, LACUSTRINE, COLLUM, LANDSLIDE, AND GLACIAL DEPOSITS, UNDIVIDED (QUATERNARY)—As mapped locally includes uppermost tertiary gravel.

Qb BASALT (QUATERNARY AND TERTIARY)—Ranges in age from about 9 m.y. to less than 1 m.y.

Ta ANDESITE TO RHYOLITE (QUATERNARY AND TERTIARY)—Andesite flows and breccia. Minor rhyolite flows and shallow intrusive rocks. Ranges in age from about 5 m.y. to less than 1 m.y.

Tb SEDIMENTARY ROCKS (TERTIARY)—Lutaceous sandstone, siltstone, and conglomerate to gravel. Minor tuff and volcanic breccia. Ranges in age from about 12 m.y. to 2 m.y.

Pz ANDESITE TO RHYOLITE (TERTIARY)—Andesite flows and breccia. Minor rhyolite flows and shallow intrusive rocks, latitic to rhyolitic ash-flow tuffs, and sedimentary rocks; sparse basalt; includes some intrusive rocks. Ranges in age from about 22 m.y. to 5 m.y.

Tc TUFF (TERTIARY)—Andesite and rhyolite ash-flow tuff. Minor rhyolite flows and shallow intrusive rocks, andesite flows, and



MAP D. DISTRIBUTION OF SITES FOR NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES WITH HIGH SCORESUM VALUES FOR THE ELEMENT SUITE SILVER, ARSENIC, GOLD, BORON, BARIUM, BISMUTH, CADMIUM, COBALT, COPPER, IRON, LEAD, ANTIMONY, STRONTIUM, AND ZINC



MAP E. DISTRIBUTION OF SITES FOR NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES WITH HIGH SCORESUM VALUES FOR THE ELEMENT SUITE BISMUTH, MOLYBDENUM, TIN, AND TUNGSTEN

EXPLANATION

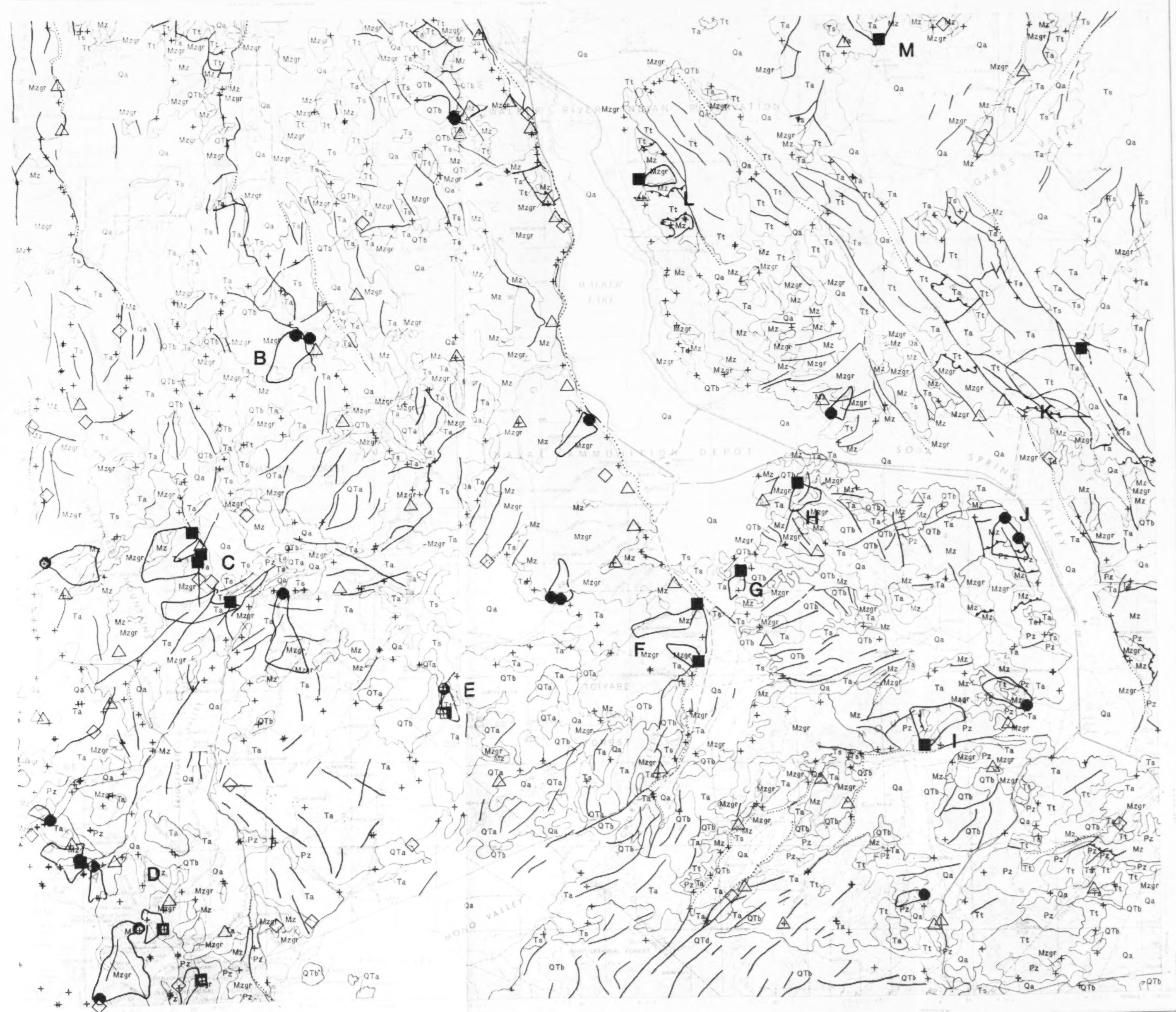
○ SAMPLE LOCALITY AND BOUNDARY OF SCORESUM ANOMALOUS FOR TWO OR MORE SELECTED ELEMENTS AT CENTER OF PLOTTED SYMBOL. UPPER 28 OF THE DATA (80th PERCENTILE); DIAMONDS, NEXT 28; TRIANGLE SYMBOL (x), REMAINING 44. (LOWER MOST SIGNIFICANT SAMPLE SITES)

M SIGNIFICANT ANOMALOUS AREA (UP SITE) IN TEXT

MAPS SHOWING DISTRIBUTION OF SCORESUM PLOTS FOR SAMPLES OF NON-MAGNETIC HEAVY-MINERAL-CONCENTRATE WALKER LAKE 1° X



ERAL CONCENTRATE SAMPLES WITH HIGH SCORESUM VALUES FOR THE ELEMENT SUITE SILVER, ARSENIC, GOLD, BORON, BARIUM, BISMUTH, CADMIUM, COBALT, COPPER, IRON, LEAD, ANTIMONY, STRONTIUM, AND ZINC



MAPS SHOWING DISTRIBUTION OF ANOMALIES BASED ON THE USE OF SCORESUM PLOTS FOR SELECTED GROUPINGS OF ELEMENTS IN SAMPLES OF NONMAGNETIC HEAVY-MINERAL CONCENTRATE, WALKER LAKE 1° X 2° QUADRANGLE, CALIFORNIA AND NEVADA

By
 MA Chaffee
 1988

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1988
 For sale by U.S. Geological Survey Map Distribution
 Box 2508, Reston, Virginia 20192-2508

OF SITES FOR NONMAGNETIC HEAVY-MINERAL CONCENTRATE SAMPLES WITH HIGH SCORESUM VALUES FOR THE ELEMENT SUITE BISMUTH, MOLYBDENUM, TIN, AND TUNGSTEN

Geology simplified from Stewart and others, 1982